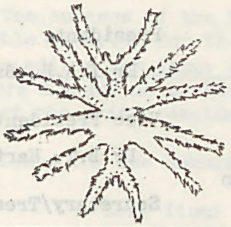
NEWSLETTER

VOLUME 16 NUMBER 1 WINTER 1978



AUSTRALIAN SOCIETY FOR LIMNOLOGY

NEWSLETTER

VOLUME 16 NUMBER 1 WINTER 1978

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some limnological problems
by W.D. Williams

THE AUSTRALIAN SOCIETY FOR LIMNOLOGY

The Australian Society for Limnology is an association of over 300 people with professional or amateur interests relating to Australian inland waters. Since its inception in 1961 the Society has played an important role in fostering limnological work in this country. The ASL promotes liaison between limnologists in academic, private and governmental institutions, and has a vested interest in the conservation of aquatic and related resources. Annual congresses are held near centres of limnological interest, and the programme includes scientific sessions, field excursions, and social activities.

The ASL produces a Newsletter, with notes on activities, articles of general interest, book reviews, and congress announcements, and an occasional Special Publication. A further periodical publication is the Directory of Australian Limnologists.

Membership applications are welcomed; four classes of subscribing membership are catered for:

- Ordinary members ($8.00 p.a.)
- Student members ($4.00 p.a.)
- Institutional members ($5.00 p.a.)
- Sustaining members ($50 p.a. or more)
- Affiliated bodies (subs on application)

NOTE: Members are entitled to receive the Aust. J. Mar. Freshwat. Res. at a reduced rate ($7.50).

Subscriptions cover the period 1 July-30 June.

Details are available from:

I. Campbell Esq.
Hon. Sec./Treasurer, A.S.L.,
Department of Chemistry
Caulfield Institute of Technology
P.O. Box 197
Caulfield East, Victoria 3145

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Newsletter contributions are always welcome, and correspondence should be addressed to the Newsletter editor. The next copy deadline is 30 September 1978.

ASL EXECUTIVE 1978-1979

President:

Dr I.A.E. Bayly

Vice President:

Dr B.T. Hart

Secretary/Treasurer:

Mr I. Campbell

Committee:

Mr J. Bell
Mr J. Blyth
Ms A. Fletcher
Mr B. Harasymiw
Dr P.S. Lake
Dr L. Llewellyn
Mr B. Mitchell
Ms J. Powling

Newsletter editor:

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Department of Zoology
Monash University
Clayton
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NEWS AND ANNOUNCEMENTS

MATERIAL FOR THE NEWSLETTER

The success of the Newsletter depends very largely on the supply of suitable material for the editor. Thus members of ASL are urged to send to the editor any items they deem suitable for publication in the Newsletter. If there is doubt as to the suitability of any item, please forward the item and let the editor decide.

Items for the Newsletter sought from members include:

news items
brief summaries of limnological activities
announcements of conferences
reports of meetings, seminars or conferences
book reviews
announcements of publications
requests for biological material
or limnological assistance

PLEA FOR ZOOPLANKTON MATERIAL

Russ Shiel is studying the potamo plankton of the Murray-Darling system for his Ph.D. In spite of covering immense distances and encountering and overcoming numerous obstacles (including kangaroos) in his search for material, he needs more material.He seeks zooplankton material from ASL members from the following localities, area or zoogeographic provinces:

impoundments on the Murray-Darling system (particularly Keepit, Wyangala, Burrendong, Burrinjuck, Hume and Eildon

billabongs of the Murray-Darling system (especially those near Seymour on the Goulburn River)

rivers of the Murray-Darling system (no particular preference indicated)

Russ is anxious to contact any ASL members living on the catchment of the Murray-Darling system who would be prepared to take occasional zooplankton samples for him. Collecting gear will be supplied.

Walter Koste in West Germany and Russ are engaged on study of the taxonomy and distribution of the Rotifera of south-east Australia. They are as well collating information on the Rotifera recorded from Australasia and the Antarctic. Consequently Russ would greatly appreciate samples of rotifers collected in south-eastern Australia.

Samples of zooplankton and/or Rotifers should be sent to:

Mr R.J. Shiel
Department of Zoology
University of Adelaide
G.P.O. Box 498
Adelaide, South Australia 5001

(... if the typist may make a suggestion - why not ask local and city-based fishing clubs to collect for limnologists; they'd be glad to have an added interest ... perhaps)

United Nations Environment Programme (UNEP)

International Referral System for Sources of Environmental Information (IRS)

IRS is a system through which organisations and individuals requiring environmental information can obtain the names and addresses of appropriate sources. In Australia the National Focal Point is in the Commonwealth Department of Environment, Housing and Community Development. Areas covered which are of interest to ASL members include:

- atmosphere and climate
- oceans, seas and estuaries
- fresh water
- human settlements and habitats
- monitoring and assessment
- wastes
- energy resources, supply and use
- chemical and biological agents and processes
- wildlife, animal and plant population
- population
- pollution and
- disasters

Details of IRS can be obtained from:

National Focal Point Manager, I.R.S.
Department of Environment, Housing and Community Development
P.O. Box 1890
Canberra City, A.C.T. 2601

Consolidated Index of Australian Journal of Marine and Freshwater Research

A consolidated index of Volumes 1 to 25 (1974) of the above journal has been prepared in line print-out form by Dr A.A. Day, Department of Geology and Geophysics, University of Sydney. The index has been issued as Report 1977/1 of unpublished reports in the geological sciences, "Its distribution is limited to interested specialists" (presumably members of ASL). Copies may be obtained free of charge from the secretary of the above department.

The Hydrogeology of the Riverine Plain of south-east Australia - Proceedings of a conference held at Griffith, New South Wales, Australia, 27-28 July 1977. R.R. Storrier and I.D. Kelly (editors), Australian Society of Soil Science, Inc. (Riverina Branch). Soft cover, 287 pages, 210 mm x 295 mm, 75 figures and maps, 56 tables.

Salinization and water logging pose a serious threat to the agriculture of the Riverine Plain of south-east Australia (the Murray Basin), where there has been extensive irrigation development involving horticulture, summer and winter cereals including rice and pastures. The associated deterioration of water quality is also presenting problems for future urban supplies to towns within the Plain and particularly for the city of Adelaide, South Australia.

/This

This Conference was organised by the Riverina Branch of the Australian Society of Soil Science to review the progress of research in the region since an earlier conference in 1966 and to assist in the development of guidelines for future research and government action to ensure the preservation of an important area of agricultural production.

The meeting which involved those concerned with research and administration in the region was concerned with five main topics - Geomorphology; Groundwater Hydrology; Irrigation on the Alluvial Plain; Management and Reclamation; and Disposal of Saline Effluent. The content of the papers and the summary of the plenary session will be of considerable interest to those concerned with the problems of irrigated land use whether at the farm, region or national level.

Price: $10.00 (Aust.) plus $2.00 postage and packaging within Australia;
or $3.40 postage and packaging overseas.

Orders to: The University Cooperative Bookshop Ltd
R.C.A.E.
P.O. Box 588
Wagga Wagga, New South Wales 2650
Australia

ASL/Australian Heritage Commission Inland Waterbody Sites

Readers were reminded in the last ASL Newsletter that the Australian Heritage Commission is seeking submissions about inland water bodies that ASL members deem worthy of protection and conservation. Sites judged by the Australian Heritage Commission as being of value will be proposed for listing in the Register of the Australian Heritage Commission.

Persons wishing to propose sites can do so on forms obtainable from Ian Campbell c/o Water Studies Centre, Caulfield Institute of Technology, P.O. Box 197, Caulfield East, Victoria 3145 or from Warren Nicholls, Australian Heritage Commission, P.O. Box 1567, Canberra City, A.C.T. 2601.

It would be greatly appreciated if those members who deal with the Commission directly could send a copy of their submission to Ian Campbell.

While sites have been proposed for Victoria, New South Wales and Tasmania, very few (in some cases zero) sites have been proposed in Queensland, South Australia and Western Australia.

Limnological Visitors to Australia

Two eminent limnologists are currently visiting Australia.

Professor Ramon Margarlef of the Department of Ecology, University of Barcelona, Spain, is visiting Australia as a Senior Queen's Fellow. He is currently at the Botany Department, Monash University and is giving a most stimulating lecture series on phytoplankton and aquatic primary production. Between 13-17 August, Professor Margarlef will be involved in a workshop on theoretical ecology at Phillip Island.

/Prof. Jim Green

Professor Jim Green of the Department of Zoology, Westfield College, University of London, is currently visiting the Department of Zoology, Monash University. From mid-July to mid-August Professor Green will be based in Melbourne and visiting volcanic lakes in Victorian western districts. In late August he will journey to the Atherton Tablelands to investigate the volcanic lakes there.

The Franklin River, Tasmania

The Tasmanian Wilderness Society has just published an arousing booklet entitled "The Franklin - Tasmania's Last Wild River" (editor Helen Gee). The material covered includes history of the river, biology of the area, the Darwin Crater, caves of the lower Franklin and the seemingly never-ending battle in Tasmania between the hydro-power developers and those favouring the maintenance of superb natural systems. The booklet costs $1.00 (plus postage) and is available from

The Tasmanian Wilderness Society
102 Bathurst Street
Hobart
Tasmania 7000

Recent Published Reports

1. Aquatic Weeds in Australian Inland Waters by D.S. Mitchell. Prepared for Department of Environment, Housing and Community Development.

2. A Phosphorus Budget for Lake Burley Griffin and Management Implications for Urban Lakes by P. Cullen, R. Rosich and P. Bek. AWRC Technical Paper No. 31.

CONFERENCES

Australian Society for Fish Biology

The Annual Conference of the Australian Society for Fish Biology will be held at Victor Harbour, South Australia. Prospective participants who were unaware of the Conference should note that the deadline for enrolment at the Conference was 30 June. Date of attendance 25-28 August 1978.

Hydrology and Water Resources Symposium 1979

This significant Symposium is organized by the National Committee on Hydrology of the Institution of Engineers. It will be held at Perth, Western Australia, from 10-12 September 1979. The aims of the Conference comprise "the traditional role of providing a forum for general papers covering Australian hydrologic practice and research ..... However the Conference will also actively seek to present a stream of papers which take a forward look at water resources management and issues. Papers directly related to efficient and multi-purpose use, and to planning and management of water and related land resources will be encouraged."

Intending authors should send a brief synopsis (not more than 250 words) of their paper to the Convener, Hydrology Symposium 1979, The Institution of Engineers, Australia, Science House, 712 Murray Street, West Perth, Western Australia 6005 - by 30 September 1978.

All other correspondence concerning the conference should be addressed to The Conference Manager, The Institution of Engineers, Australia, 11 National Circuit, Barton, A.C.T. 2600.

International Symposium on the Hydrology of Areas of Low Precipitation

This symposium forms part of the programme of the Seventeenth General Assembly of the International Union for Geology and Geophysics (IUGG), which will be held in Canberra from 2-15 December 1979. Three topics will be dealt with:

(a) stream flow characteristics with special reference to low and high flows

(b) quantitative and qualitative aspects of the relationship between surface water and subsurface water

(c) effect of sediment production on land use and management

Papers are invited for this symposium and abstracts not exceeding 200 words should be sent to both the following addresses:

(i) International Association for Hydrobiological Sciences
Assistant Editor
Institute of Hydrology
Wallingford
Oxon, U.K. OX10 8BB

(ii) Australian National Committee for Hydrology
Australian Academy of Science
P.O. Box 783
Canberra City, A.C.T. 2601

Information on the Conference is available from the second address.

V International Symposium on Tropical Ecology

This conference is being organized by the International Society of Tropical Ecology and the University of Malaya and will be held in Kuala Lumpur, Malaysia, between 16-21 April 1979. The theme is "Ecology and Development". Enquiries to:

Professor J.I. Furtado
General Secretary, Organizing Committee
V International Symposium on Tropical Ecology
c/o Department of Zoology
University of Malaya
Kuala Lumpur, Malaysia

Third European Icthyological Congress

This conference to be held in Warsaw, Poland, between 18 and 25 September 1979 will deal with five main items:

1. Evolution and genetics of fishes
2. Zoogeography: current changes in the distribution of fish species
3. Ecology, with emphasis on adaptational changes induced in fishes by human activities
4. Biological problems of fish culture
5. Taxonomy and related problems

All enquiries to be addressed to:

Trzeci Europejski Kongres
Ichtiologów
Institut Rybactwa Śródladowego
10-957 Olsztyn-Kortowo, blok 5
Poland

Third International Conference on Ephemeroptera

This Conference organized by the Standing Committee on Ephemeroptera will be hosted by the Freshwater Institute, Fisheries and Environment, Canada, and the Departments of Zoology and Entomology, University of Manitoba. The Conference will be held from 4-10 July 1979 on the campus of the University of Manitoba, Winnipeg, Canada.

For preregistration forms and information write to:

John F. Flannagan, Convenor
3rd Int. Conf. on Ephemeroptera
Freshwater Institute
501 University Crescent
Winnipeg, Manitoba
Canada R3T 2N6

International Symposium on the Brine Shrimp *Artemia salina*

The objectives of this symposium are:

(a) to review our knowledge of *Artemia salina*

(b) to facilitate the exchange of recent research findings on *Artemia salina*

(c) to promote contacts among specialists in different areas of research on *Artemia salina*

The Conference will be held from 20-23 August 1979 in Corpus Christi, Texas, U.S.A., near the Port Aransas Marine Laboratory of the University of Texas. Enquiries to:

International Artemia Symposium
Registration & Local Arrangements Office
The University of Texas Marine Science Institute
Port Aransas Marine Laboratory
Port Aransas, Texas 78373, U.S.A.

International Conference on Developments in Land Methods of Waste Water Treatment and Utilization

This conference will be held in Melbourne from 23-27 October 1978. Enquiries to:

IAWPR Conference Secretary
Melbourne and Metropolitan Board of Works
P.O. Box 4342
Melbourne 3001
Victoria

The registration fee is $120.000

ANZAAS

At Auckland University, Auckland, New Zealand; from 22-26 January 1979.

Urban Runoff Workshop

The Australian Water Resources Council, the University of New South Wales and the Snowy Mountains Engineering Corporation are jointly sponsoring a workshop on urban runoff. The workshop programme is being designed to meet the needs of engineers and surveyors working in this area. Venue: Sydney. Date: 6-12 December 1978.

BOOK REVIEW

River Pollution Studies G.A. Best and S.L. Ross 1977
Liverpool University Press, Liverpool
3.50. ISBN 0 85323 363 2

Reviewed by W.D. Williams

I bought this small book on the strength of its title (and flushed with a recent tax return). My advice to fellow Australian limnologists is: don't. That is not to say that the book is not interesting or useful; indeed it probably will be for the upper school classes in the British Isles. However, an Australian academic can scarcely be the judge of that. For use in Australian schools, better, and more appropriate texts are available.

The first chapter (~ 2 pages) introduces the subject. The second (~ 20 pages) discusses in succinct albeit elementary fashion the origins and effects of river pollution. The third, the longest (37 pages), is a practical guide to the more simple chemical methods used in water pollution studies. The fourth (by 'guest' Dr J.W. Eaton) is a potted essay on the biology of polluted waters. Illustrated by a series of highly unoriginal line drawings - they are all from Hynes' Biology of Polluted Waters - a brief (overbrief?) account of the biota is given (Dr Eaton: I had extreme difficulty in noting the "numerous species of crustaceans" in Plate 7!). Chapter 5, suggested projects, can only be described as weak; clearly the authors were tired at this stage. Apart from those drawings reproduced from Hynes' book, drawings are rather poor and somewhat unprofessionally labelled (and was it necessary to cut costs by not justifying the right hand text margins?). The references are probably adequate though scarcely up-to-date.

All in all, if you are an Australian science teacher, keep your money. I leave it to those in Britain to judge the accuracy of the publisher's blurb on the back which states that "it will be widely welcomed by teachers in the field".

ASL BUSINESS

Minutes of
4th Executive Committee Meeting - Menindee - Friday, 19 May 1978

Present: D. Buckmaster (Chairman), L. Llewellyn, A. Fletcher, B. Hart, R. Williams, W. Williams (by invitation), D. Pollard

Previous Minutes: Minutes of the 3rd executive meeting were accepted.

17th Annual Congress: Dr Llewellyn and Mr Buckmaster gave a brief progress report on the organization of the Congress and stated that all appeared to be in hand. Dr Llewellyn indicated the possible need to purchase more refreshments during the conference and after some discussion with the Treasurer it was decided that the executive agreed to an additional expenditure of up to $300.00 for other conference organisers.

Jolly Award: Dr Bayly on behalf of the Jolly Award Committee will recommend that Mr John Lake be awarded posthumously the Jolly Award for 1977-1978.

The executive fully endorsed this recommendation.

It was pointed out the actual prize of a book had not been organised for 1976-1977 Jolly Award winner, Professor W.D. Williams. Secretary to organise this.

Newsletter: Some discussion on the status of the ASL newsletter took place. The following points were made:

(a) There is a need for a clear editorial policy regarding the acceptance of papers and that this should appear in the front of the newsletter.

(b) If articles of scientific merit are to be accepted for publication in the newsletter they should be essentially of regional interest and larger papers should be submitted to other journals such as AJMFR.

(c) The newsletter should be upgraded in quality and should contain both news items and articles of scientific merit.

It was agreed that the whole question of the status of the newsletter should be discussed at the AGM.

Newsletter editor Professor Williams submitted his resignation as newsletter editor to the executive committee. In so doing he recommended that the editorship should be changed every two to three years. Professor Williams informed the executive that he had approached Dr P.S. Lake to take on the editorship.

/Education

Education Sub-committee:

Members agreed that the ASL should attempt to keep the education sub-committee functioning and it was suggested that Ralph Grandison be approached to continue this work.

Plecoptera Key:

Professor Williams circulated copies of the recently published plecoptera key, a special ASL publication. He informed the executive that the cost of printing the 2,000 copies was approximately $450.00 with an additional $150-$200 for transport costs. The executive agreed that the key would be distributed free to financial members and would be on sale for $2.00 a copy for all other interested parties.

New special publication:

Professor Williams informed the executive that he had approached the organisers of a conference entitled "Water Research in South-Eastern Queensland" which was held during 1978 about the possible publication of these papers as either a special newsletter or special ASL publication. The papers had been all submitted to Professor Williams and simply required typing and production. The executive decided that this was a matter for the new executive and referred it to them for decision.

Changes to Constitution:

Dr Pollard reported that he had looked at the Constitution and felt that a number of minor grammatical changes should be made to the Constitution. Additionally it was suggested that modifications could occur with regard to voting rights for student members and the need for the society to have a publications account. Again it was decided that these changes should be referred to the new executive committee for action.

Fees for 1978-1979:

The Secretary-Treasurer reported that the financial state of the society was very healthy and recommended that there should be no increase in the fees for the next financial year. He recommended that the subscription rates for 1978-1979 be $8.00 for members, $4.00 for students and $5.00 for institutional members. It was agreed that this fee structure be recommended to the AGM.

18th ASL Congress:

This was discussed briefly and it was suggested that the decisions be left to the new executive committee with suggestions regarding venue be canvassed at the AGM.

1978-1979 Executive:

Some discussion took place on this matter and it was suggested that there would be much benefit in the executive remaining essentially in Victoria for 1978-1979. Recommendations along these lines would be made to the AGM.

D. Buckmaster (President)
B.T. Hart (Secretary-Treasurer)

ASL ANNUAL CONFERENCE - Menindee 1978

As is the case for most ASL Conferences that I have attended, recollection is uneven and for certain events, highly coloured. The ASL bivouac in the arid zone was celebrated meteorologically by a warning downfall of 2½" of rain. However, as many will testify, this did not prevent the gaily lit beer truck from getting through. Many embarked for Menindee unprepared for the vagaries of the inland. The latent talents of those harbouring the desire to forsake science and take up rally driving were well put to the test - especially for those homing in from the south. The Pooncarie route in particular held many surprises with the mud slide of the Harcourt by-pass being the pièce de résistance. Unfortunately kangaroos also tested the manoeuvering skills of some pilgrims. Some, without the time to tramp, hitch-hike or ride to Menindee, arrived by the air arm of ASL.

The bused-in provisions and food provided a wholesome and abundant fair, though many were more interested in watching and marauding the prowling beer truck. The papers covered a wide range of limnological topics and their interest was sufficiently intense to hold their audience even at times when the air conditioning of the shearing shed became very obvious. The A.G.M. went along methodically and calmly until the agenda item of the Newsletter and what it should publish arose. Many suggestions of what to do with the Newsletter were voiced. It is hoped that this matter will be resolved shortly.

Evening entertainment was highly varied - eating, drinking, argueing, etc. A profusion of interpretations of the verb "to dance" was revealed; from primate agonistic gestures to high speed congas (congos and congers). New talents of some of the senior members of the society were revealed ranging from a display of hot lips barbery to a demonstration of the martial art of despectaclization. The annual dinner was highlighted by a fine, illustrated address on limnology with a chopper.

It was a memorable, valuable and enjoyable annual conference and thanks are emphatically due to those ASL members from New South Wales who put so much time and effort into making the conference such a success, and also to the N.S.W. National Parks Service for providing such an unusual venue.

The success of the conference was evidenced by the large turn-up of 95 members, all of whom departed to their various homes seemingly in a refreshed frame of mind. The trend of choosing a venue where all conference participants live-in (so to speak) and cannot be seduced by alternative attractions seems to be a most fruitful one.

Abstracts of papers presented at 1978 Annual Conference of ASL at Menindee

Limnological Conservation - Rivers and Wild Rivers in Australia

by P.S. Lake
Department of Zoology, Monash University
Clayton, Victoria 3168

Conservation of aquatic ecosystems as opposed to resource husbandry is defined and the conservation values of freshwater ecosystems outlined. In the past there appeared to have been a lack of concern in Australia for the conservation of lotic water bodies in comparison with lentic water bodies. Unfortunately due to continuing "development" the number of intact, unmolested rivers in Australia is steadily declining. It is contended that the effective conservation of lotic water bodies in Australia needs urgent attention. The concept of wild rivers is outlined and it is stressed that if any wild rivers are to be conserved in Australia, immediate action is required.

Dartmouth - a Storage in its Infancy

by Joan Powling
State Rivers & Water Supply Commission
Victoria

Construction of Dartmouth Dam on the Mitta Mitta River in north-eastern Victoria is nearing completion. It will be the deepest man-made lake in Australia (170 metres) and it is estimated that with average river flows it will take four years to fill.

Closure of the dam took place early in November 1977 and storage commenced. The pool behind the dam wall, in a deep V-shaped gorge, began to fill rapidly. Within four weeks of closure stratification was pronounced and there was a suggestion of the onset of meromixis.

The physico-chemical observations of the first six months of storage are outlined and attention is drawn to certain management practices which may lessen or prevent problems in the early days of future water storages.

The development of the plankton is discussed.

River Improvement in Victoria

by Peter Rogan
Fisheries & Wildlife Division
Ministry for Conservation, Victoria

River Improvement Trusts are local constituted bodies, responsible for the maintenance and improvement of rivers and streams within their area. Although the majority of the work of most trusts is beneficial, these bodies are inadequately funded, have inadequate power and are inadequately advised and their treatment of natural ecosystems has on some occasions ranged from unsympathetic to catastrophic. A major review of the approach towards river management and maintenance is urgently needed.

Narrabeen Lake - a case for a management policy

by D. Cheng
Department of Environmental Biology
School of Life Sciences, N.S.W. Institute of Technology
Gore Hill, N.S.W. 2065

Narrabeen Lake is the largest remaining coastal lagoon within the Sydney area. The lagoon and its catchments have great aesthetic qualities and the lagoon is serving both as a wildlife sanctuary and a recreation area for activities ranging from fishing, sailing to water skiing. However, increasing urbanisation and other activities such as quarrying and rubbish tipping in the catchment area are creating environmental problems for the lagoon. The lagoon and its feeder creeks are polluted and siltation has been such a serious problem that many parts of the lagoon has become alarmingly shallow. The problems are aggravated by the fact that the shallow opening of the lagoon to the sea is frequently blocked by sand bars. As a result there is only limited tidal flushing.

This paper outlines the major ecological features of the lagoon and its feeder creeks, the sources of pollution and other disturbance. A management plan aiming to halt further deterioration of the lagoon is also outlined.

Trace Metal Speciation in some Victorian Waters

by B.T. Hart
Water Studies Centre, Caulfield Institute of Technology
Caulfield East 3145

In recent times aquatic chemists have become increasingly interested in developing analytical methodologies that will better define the physico-chemical forms (speciation) of toxic trace metals present in aquatic systems. Knowledge of the speciation is an essential prerequisite to understanding the toxicity, bioaccumulation, mobility and eventual fate of trace metals added to such systems.

/At CIT

At CIT we have developed a series of relatively simple techniques for providing information on metal speciation in natural waters. The most promising of these include membrane and ultra-filtration, and a chelating resin (Chelex-100). Extensive testing of these techniques has been carried out on a wide range of samples ranging from lake and river waters, sewage effluents and interstitial waters.

This paper will discuss the data relating to the speciation of Fe, Mn, Cu, Cd, Pb and Zn in the Yarra River and in several Victorian lakes.

Analysis of Impoundment Water Quality Data by a Multivariate Classificatory Technique

by E.A. Scribner
N.S.W. State Fisheries

Major irrigation impoundments on the headwaters of rivers in New South Wales are highly elongate, deep lakes. As a conceptual model they may be conveniently depicted in longitudinal cross section, and their water quality attributes investigated by sampling at a number of depths and at a number of stations located in deep water at varying distances from the dam wall.

Measurement or analysis of the samples so collected yields a number of values for numerical attributes, which are largely independent of one another. Multivariate classification affords a method for the simultaneous evaluation of several or all of these attributes, in order to divide the waters into a number of types.

The most important seasonal changes in the physical and chemical attributes of the waters of deep temperate lakes occur during the summer period of thermal stratification. In order to take these changes into account, samples should be collected during early summer (November) and late summer (February-March).

During the summer of 1974-1975 eight major irrigation impoundments in the N.S.W. western slopes were each sampled twice, involving a total of sixty-four stations and two hundred samples on each occasion. Eighteen parameters were measured or analysed on each sample. Because several of the dams had two or more major river arms, a total of twelve different longitudinal cross sections was required to depict the results.

The CSIRO programme POLYDIV was used to split the fused data into 25 groups, based on all 18 parameters and also based on three groups of these parameters; designated physicochemical, major ion and nutrient-chlorophyll. These groups are displayed on longitudinal cross sections of the dams.

This technique is used as an aid in interpretation of water quality data and is intended as supplementary to the evaluation of individual parameters. The full outcome of application of this method to the data available is as yet undetermined and considerably more work is required.

Heavy Metal Levels in Ten Species of Freshwater Fish

by Elizabeth Auty
N.S.W. State Fisheries

Heavy metal levels were analysed in bony bream, rainbow trout, brown trout, European carp, tench, catfish, Murray cod, golden perch, silver perch and redfin.

Cadmium, lead and arsenic were barely detectable in all species. Copper, zinc and selenium showed some variation between species but all levels were within the limits recommended by the N.H. & M.R.C.

Some individuals of each perciform species exceeded the 0.5 ppm limit recommended for mercury but the levels in all other species fell within the limit. A statistical analysis of the data suggested that metabolic dissimilarities could be a partial cause of the variation in mercury levels between species. Investigation of this aspect is recommended to theoreticians but a comment on the effect of dehydration during freezer storage is offered as a warning. A number of other causes of variation including trophic structure and environmental inputs are also discussed.

A Preliminary Note on the Biology of *Mirawara aapta*, Harker (Ephemeroptera:Baetidae)

by Ian Campbell
Water Studies Centre, Caulfield Institute of Technology

Although the carnivorous nymphs of the genus *Mirawara* are frequently abundant in stony rivers and streams in south-eastern Australia, they are not usually collected in large numbers in normal invertebrate collections. Studies on a population in the Aberfeldy River (Victoria) suggest several reasons for this.

Macroinvertebrate Communities of some Northern Victorian Lakes

by J.D. Blyth
National Museum of Victoria

Samples of approximately equal effort of aquatic invertebrates were collected from seven water bodies of the Wimmera River-Outlet Creek system, and from nine lakes in the Kerang region, in autumn and spring 1977. Salinity (T.D.S.), turbidity and temperature readings were also taken at most collecting sites.

A relatively small number of common, widespread species were dominant in all but lakes with salinities above about 7,000 mg/l. Below about 4,000 mg/l both diversity and abundance appeared to be largely dependant upon abundance and type of live or dead plant material. The three temporary lakes in Wyperfeld National Park supported a considerably more diverse fauna than other lakes examined.

Aerial Survey of Arnhem Land Wetlands for Crocodile Nesting Habitat

by W.E. Magnusson, G.C. Grigg and Janet A. Taylor
School of Biological Sciences, University of Sydney

Whereas regulations presently prevent hunting of crocodiles in Australia, it is likely that, with proper management, sustained yield harvesting of C. porosus could be achieved in the future. Any such management policy would need to set aside refuges with substantial areas suitable for nesting as well as other resources required for growth and maintenance of a crocodile population. The purpose of our study was to determine the location of areas suitable for nesting, with a view to future management. Because of past hunting, the present distributions of crocodiles in northern Australia does not necessarily reflect the distribution of habitat suitable for crocodiles. In a survey for suitable nesting areas one must therefore depend to a large extent on features of the habitat other than the presence or absence of nests or juvenile crocodiles. Accordingly, features diagnostic of suitable nesting habitat were determined by a ground reference study in the Liverpool and Tomkinson Rivers where reasonable densities of nests and juveniles were known to occur. This resulted in a set of criteria by which suitable nesting habitat could be identified reliably from the air.

We then carried out an aerial survey of all coastal wetlands between Smith Point (53LJH870688) and Gove (53LPG850480), northern Australia and the locations of habitat suitable for nesting have been documented. Detailed reports are lodged with the Australian National Library. As a result of the survey we are able to indicate areas in which different types of management could be applied in the future.

Reference: Magnusson W.E., G.C. Grigg & Janet A. Taylor (1978). An aerial survey of potential nesting areas of the Saltwater Crocodile (Crocodylus porosus) on the north coast of Arnhem Land, northern Australia. Aust. Wildl. Res. 5(3): in press.

The Distribution of Salmo trutta and Galaxias olidus in some Victorian Streams

by Andrea Fletcher
Department of Zoology, Monash University

Circumstantial evidence from a study of four streams shows that the presence of brown trout, Salmo trutta, may be responsible for the decline of Galaxias olidus populations in upland sections of Victorian streams. A trout introduction experiment over four months gave further support to this.

Two streams that had natural waterfall barriers which would prevent upstream migration of S. trutta were selected for a study over four seasons. Running Creek in Kinglake National Park contained only Galaxias olidus and Gadopsis marmoratus above a waterfall. Below the falls the total biomass density of fish was similar but the dominant species was S. trutta. Gadopsis marmoratus, Galaxias olidus and Anguilla australis occurred in very low densities and biomass. This fragmented distribution of G. olidus also occurred in

/ Watchbox

Watchbox Creek, a tributary of Seven Creeks near Strathbogie. Galaxias olidus was abundant above a waterfall but was rare downstream where S. trutta was present.

Examination of two alpine streams on the Bogong High Plains and Mount Buffalo showed that populations of G. olidus and S. trutta were allopatric. The distribution of G. olidus was restricted to sections of streams above waterfalls.

Hatchery trout were introduced over 1977-1978 summer to an enclosed section of Watchbox Creek where G. olidus was present. After four months the biomass of G. olidus in the experimental section was almost half that of a control section directly upstream. Selective predation on the 0^+ year class galaxiids took place.

AUSTRALIAN SOCIETY FOR LIMNOLOGY
Minutes of
17th Annual General Meeting - Kinchegar National Park - 20 May 1978

Adoption of Agenda: The Agenda as circulated prior to the meeting was adopted.

Apologies: Apologies were received from K. Walker, M. Geddes, B. Bowles, D. Francois, B. Malcolm, B. Chessman, R. Croome, D. Lynch, G. Wood, J. Wharton, N. Williams, T. Scribner, D. Mitchell, D. Cheng, P. McLaren, R. Pearson.

Minutes: The minutes of the previous AGM were circulated to members prior to meeting. These were duly accepted.

Correspondence: Secretary-Treasurer tabled correspondence and pointed out that all matters requiring attention were listed under general business.

President's Report: Mr Buckmaster reflected upon the increasing diversity of interests of the current membership of ASL. He spoke of his pleasure in working with the executive committee during 1977-1978 and also referred to the extremely competent organisation of the 17th Congress by Dr L. Llewellyn.

Secretary-Treasurer's Report: Dr Hart summarised the society's business for the year. He commented on the introduction of a Victorian section of ASL with a meeting in November 1977 which was addressed by Dr David Mitchell. He suggested that there was much merit in continuing the activities of special State branches of ASL in future.

Membership: Membership statistics were circulated prior to the meeting and are attached. Dr Hart commented that there were approximately 40 new members during the year which was approximately the same number as the previous year. He also commented on the relatively large number (78 full members and 10 students) of members who were unfinancial at the moment. He suggested that there was still need for active recruitment drives for new members and recommended that secondary schools and libraries of all tertiary institutions should be approached regarding membership.

Dr Hart reported that a computer listing of members had been developed at CIT and that this would assist in keeping up the changes in membership and with the production of a new directory of members; the latter should be produced by about July 1978.

/Financial Report

Financial Report:

The financial statement of the society's activities during 1977-1978 was circulated prior to the meeting and is attached to these minutes. Dr Hart reported that the general financial state of the society was very healthy.

He expressed concern over the number of unfinancial members and related the problems caused by lateness of subscriptions for AJMFR. He recommended that the publication account either be disbanded or at the very least be put into a higher interest account.

He recommended that the subscription rates for 1978-1979 be as follows:

Members	$ 8.00
Student members	$ 4.00
Institutional members	$ 5.00
Sustaining members	$50.00

Further, be recommended that single copies of the newsletter be charged at $1.00 each.

Honorary Auditor's Report:

Professor W.D. Williams reported that the society's finances were in order and commented upon the marked improvement in the accounting procedures over the preceding year.

Editorial Committee Report:

Professor Williams reported that special publication No. 2 "The Plecoptera Key" had just been completed and was now available to members. The document was published at the University of Tasmania. The AGM expressed its thanks to Dr P. Tyler for his efforts in having the document published.

Professor Williams reported that there was a possibility that Dr David Thomas if approached would be prepared to produce a special publication "A Key on the Diatoms of Australia". The meeting decided this was an excellent idea and referred it to the new executive for action.

Newsletter Editor's Report:

Professor Williams reported that there would be three issues of the newsletter this year with the last copy now available for members. He expressed the opinion that there should be four newsletters per year as a general rule. Professor Williams informed the meeting that he was relinquishing the position of editor and had made suggestions to the executive regarding a possible replacement. The President thanked Professor Williams for his efforts over the past three years as editor of the newsletter.

Report of the Jolly Award:

Dr I.A.E. Bayly announced that it was decided to posthumously award the Jolly Award to the late J.S. Lake. Dr Bayly then read a statement that accompanied the nomination for the award. It was agreed by the meeting that details of the award would be determined by the new executive.

/Venue for

Venue for the 18th Congress:

Considerable discussion on possible sites for the next congress took place. There is general approval from the meeting for every 2nd or 3rd congress being held in some site similar to Kinchegar. A number of sites were suggested as possible venues for next year's congress and it was decided that these suggestions would be taken up by the new executive.

Election of Office Bearers:

The following were duly elected -

(Mr Buckmaster takes an ex-officio position)

President	Dr I. Bayly
Vice President	Dr B. Hart
Secretary-Treasurer	Mr I. Campbell

Committee: Dr L. Llewellyn (NSW), Dr J. Bell (NSW)
Mr B. Mitchell (SA), Dr S. Lake (Vic.)
Ms A. Fletcher (Vic.), Ms J. Powling (Vic.)
Mr J. Blyth (Vic.), Mr B. Harasymiw (Vic.)

Appointment of Honorary Auditor:

Professor W.D. Williams was appointed to this position.

Annual subscription:

Secretary-Treasurer recommended the following subscriptions for 1978-1979 -

Members	$ 8.00
Student members	$ 4.00
Institutional members	$ 5.00
Sustaining members	$50.00

These rates were agreed to.

General business:

(a) Arising from the previous AGM

1. Education Sub-committee

The secretary reported to the meeting that the convenor of the Education Sub-committee Mr Geoff Clark had recently relinquished this position.

The meeting confirmed the need for an Education Sub-committee with its primary objective to foster the area of Limnology in secondary schools.

Ralph Grandison agreed to act as the new coordinator of this sub-committee and will attempt to reactivate it.

The secretary is to send all previous documents and correspondence to Mr Grandison.

2. Editorial Policy Newsletter

Considerable discussion took place on the general question of whether or not the newsletter should be a formal publication. A diversity of views were presented and finally the following motion moved by D. Pollard, seconded by R. Tilzey was carried.

/"That the

"That the incoming executive committee investigate the most feasible means of publishing limnological articles of scientific merit and until this is resolved the newsletter should remain as it is at present, a formal publication."

3. Consulting Services

The meeting was told that there is nothing to report on this matter as it had partly been raised at the previous AGM.

(b) Current business

1. Memorial to J.S. Lake

Considerable discussion took place on the possible format that a memorial to John Lake could take. Finally the meeting resolved that the incoming executive should investigate suitable means of commemorating J.S. Lake in some way over and above the Jolly Award.

2. The new president expressed the thanks of the general ASL membership to the retiring president and his executive committee for the work that that they had done in continuing the affairs of the society throughout the year.

Meeting closed at 5.45 p.m.

B.T. Hart
Secretary-Treasurer

AUSTRALIAN SOCIETY FOR LIMNOLOGY

Financial Statement for 1977/1978

A. General account

Income		$	Payments	$
Subscriptions -	Members	1,420.50	Postage	188.92
	Students	151.00	Newsletter production	160.22
	Institutional	175.31	Transport	79.99
	Sustaining	100.00	CSIRO (AJMFR Subs.)	907.50
	AJMFR	936.50	Miscellaneous	13.30
Other (Crustacea Key, Bulletins)		104.31		
17th Congress		1,080.00		
Interest		45.57		
Balance at 12 May 1977		536.43	Balance at 30 April 1978	3,199.69
		$4,549.62		$4,549.62

B. Publications account

Income		Payments	
Transfer	3.68	Nil	-
Interest	57.54	Balance at 30 April 1978	2,169.43
Balance at 12 May 1977	2,108.21		
	$2,169.43		$2,169.43

C. Jolly Award account

Balance - $131.07

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Membership details		1977/1978	1976/1977
Full members	256		
Students	55	311	273
Institutional members		57	58
Sustaining members		2	-
New members		38	39
Resignations		2	5

"Audited and found a correct statement by
W.D. Williams 17.5.78."

JOLLY MEMORIAL LECTURE

Australian Water Resources: some limnological problems

by W.D. Williams
Department of Zoology, University of Adelaide

Introduction

My presidential address to this Society some years ago (Williams 1976) was entitled "Some problems for Australian limnologists". That address did not emphasise applied aspects of the subject. Today, it is apposite to follow a similar direction and discuss applied problems. This choice of subject is also apposite in that a rather large text containing 35 chapters by various authors and entitled An Ecological Basis for Water Resource Management has recently been delivered to A.N.U. Press - and I have had a minor association with this (as editor!). So you see, in preparing this address I have had the benefit of a vast store of unpublished, original, modern material written by a glittering array of experts and thus far inaccessible in toto to all but me; even the authors themselves have seen only their own chapters!

There is, of course, the responsibility of ensuring that this address neither pre-empts nor steals the thunder of what others have written; but I do not believe there will be serious objection to any abstraction by me from appropriate areas for general synthesis and discussion at a meeting like this. Indeed, it is possible to regard this address as useful publicity for the views of the authors involved. In any event, I shall certainly indicate the source of any information. Considered also, I should add, are some problems and areas of applied limnological research not dealt with in the book. Perhaps that fact gives an added significance to this address. As in my presidential lecture, the regional aspects of the subject matter are given greater prominence than those of wider geographical applicability.

To an audience like this, little attention need be drawn to the overall importance of biological problems in the management of Australian water resources. However, for the record it should be stated that biological problems problems there certainly are, and that Australia is particularly ill-prepared to deal with them: research is fragmented, there is no strong historical tradition of freshwater biological studies in Australian institutions of higher learning (though that situation is now changing), and Australia lacks any cohesive national body specifically charged to undertake water resource investigations sensu lato (the A.W.R.C. and C.S.I.R.O. do not fill that niche). It may be that the findings of the current Senate Standing Committee investigating the role of the Commonwealth in water resources will change all that; but frankly, within the present economic climate, I believe it unwise to entertain too much optimism on that score. At any rate, the situation at present is as described. It is true that some enlightened murmurings have been heard in Canberra over the last few years (e.g. the National Water Policy Statement adopted by the A.W.R.C. in October 1975): none seems to have assumed any substance. Indeed, considering inflation, the monies available for support of research from A.W.R.C. coffers are even smaller this triennium.

Matters can be discussed under five broad headings: the aquatic fauna, the aquatic flora, water supplies, waste management, and aquatic environments. None of these subjects of course can be treated in a completely separate fashion: the divisions represent merely a convenient device for purposes of discussion.

/The aquatic

The aquatic fauna

The total commercial catch of fish from inland waters bears no comparison with that from the waters surrounding Australia. Nevertheless, taken absolutely, it is not insignificant. Commercial fishing in inland waters, however, is based on a very insecure and shaky foundation of basic biological knowledge. That much has been known for a long time, but Pollard, Llewellyn and Tilzey (in press) from a position of considerable authority discuss the management of Australian freshwater fish and fisheries and firmly underscore the point. They note that extremely little is yet known about the ecology, distributions, migrations and factors governing the abundance of Australian native freshwater fish (of both commercial interest and otherwise). No fish ladders have been erected on any Australian dam, and indeed the form such ladders should take is not even clear. Here then are some of the first problems of an applied limnological bent. Resolution of them has added urgency in that stocks of many commercial native fish have declined dramatically in the past few decades.

A number of somewhat related problems concern Australian aquaculture. As pointed out by Morrissy (in press), the only fish commercially farmed in Australia is the trout, and production procedures are largely an imported technology. A number of problems surrounds the aquaculture of native fish (including crayfish), but there is no overwhelming reason why at least some of them may not play a minor - in not major - commercial aquacultural role. The general problem with native fish is how to stimulate breeding on a reliable large-scale annual basis. Particular problems include, for example, the question of how to raise large numbers of barramundi (Lates calcarifer) in hatcheries; if that question could be answered, then many of the "difficulties" which beset fisheries authorities in connection with the stocking of northern standing water-bodies and declining stocks of barramundi in northern and north-eastern rivers would disappear.

There are also several problems of other than academic interest associated with introduced 'wild' fish. We know little of a precise nature about the impact of the carp. It is said to have a significant and deleterious environmental impact, but the evidence to-date is essentially circumstantial. Perhaps the Victorian Fisheries Division will be able to provide us with more rigorous information shortly. A whole range of problems, of course, are being generated by the huge and largely unregulated influx of aquarium fish which presently enters Australia. Jim Wharton drew our attention to this subject at the last Congress, and the matter is again discussed by Tilzey (in press). I am led to believe that the legislative difficulties of correcting the situation are immense, but immense or otherwise the dangers are great and increase. Briefly there is the danger of importing species which could escape and give rise to noxious feral populations (it may be noted that Papua New Guinea is apparently already well on the way to becoming the sort of exotic cesspool that Florida is claimed to be so far as imported fish are concerned - largely through irrational importations), and the dangers of importing fish diseases (including parasites), noxious aquatic plants, human disease vectors and human diseases. It is disturbing to read in the latest issue of the Newsletter (Vol. 15, number 3) that an important parasite of crayfish has recently appeared in Australia (Carstairs 1978). The various problems associated with human diseases vectored by aquatic animals (particularly by snails and insects) are discussed by Petr (in press). You require no reminder from me that so far as such diseases are concerned, Australia is indeed the lucky country: a large fraction of our land mass is subtropical, yet we lack the debilitating human diseases vectored by aquatic animals and which unfortunately are so characteristic of most tropical countries (schistosomiasis, malaria, oncocerciasis, etc.).

/Finally

Finally in this section, two specific areas of applied limnological interest sensu lato may be mentioned. The imported cane toad (Bufo marinus) is a considerable nuisance throughout much of eastern Queensland. For part of its life cycle it is aquatic and biological control techniques might be most efficacious at that time. In any event, the biological control of the cane toad is a worthy topic for aspiring applied limnologists (M.J. Tyler, in press). And secondly, as in the case of our 'commercial' native fish, wildfowl management is based on a precarious amount of fundamental knowledge. As Braithwaite (in press) points out, for effective wildfowl management a good deal more research is needed both at the initial level to aid in the development of management guidelines, and at a more intensive level for long-term management strategies.

Aquatic flora

Conveniently - if illogically - leaving aside any consideration of the algae until later, I restrict my brief remarks here to macrophytes. With these, a major problem is excessive growth either as a symptom of eutrophication in natural water bodies, or as unwanted plant material in man-made lakes and channels. According to D.S. Mitchell (in press) the major difficulty involved is again our lack of basic knowledge. I quote him directly: "The most serious constraint to improving the management of aquatic vegetation in Australia is lack of basic ecological information about the systems, the plants concerned, and their interrelationships in this country."

This basic problem apart, however, there are several problem areas which command attention; only some are receiving it. Biological control is at least one important area which is subject to active and very worthwhile investigation by Dr Harley of the CSIRO, but the full environmental implications of control by chemical means - by far the most important control method in Australia at present - receive very much less attention. Even less attention is being accorded to macrophytes as agents in wastewater control despite the increasing evidence from overseas that in this capacity they have much to offer: they are exceedingly tolerant to a wide range of pollutants, have high productivities (higher than phytoplankton), are easily harvested, and are likely to be more satisfactorily utilized after harvesting. Honourable exception is made of the work of John Weir and associates at Armidale in this regard.

Water supplies

At all points in the distribution and collection of water supplies there are problems of limnological interest. In pipelines, bacterial growths may severely inhibit rates of passage; in Tasmania, for example, it is estimated that the Hydro Electric Commission loses $3,000,000 per annum from this phenomenon (P.A. Tyler, in press). Similar problems exist on the mainland). Yet the approach of authorities to an effective, biologically-based control programme appears marked by hesitancy: certainly the bactericidal effect of chlorine in the field situation remains unresolved (P.A. Tyler, in press).

Within pipelines, other material - both particulate and dissolved - may also be of concern. Of particulate material, algae and pathogenic organisms give rise to the greatest concern. The subject of algal problems in water supplies is discussed by Smalls (in press); in brief he notes that problems include unfavourable modification of pH, the development of undesirable colour, taste and odour characteristics and increased turbidity, screen and filter clogging, and the elevation of organic loadings in distributional systems. Many problems of this sort can be satisfactorily managed by the application of sound limnological principles - as has been well shown by Smalls' own work with the Sydney Water Board. The occurrence of pathogenic organisms in water supplies is discussed by Forsyth (in press) who draws

/attention

attention to a major paradox with regard to these: how can water supplies transmit diseases when dilutions appear to be well below infectious dose levels. The paradox remains unresolved. Also unresolved it might be added is the question of how important in water supplies are viruses and toxic chemicals (especially those of a potentially carcinogenic nature). Both topics are presently the object of investigations by State instrumentalities either under the aegis of the A.W.R.C. or funded from State sources.

Most water supplies in Australia emanate from man-made impoundments or reservoirs, and it is in the management of these that applied limnologists can be said to come into their own. No elaboration is needed here, but brief comment on two matters of current interest is made.

Firstly, there is the matter of public access to man-made impoundments and their catchments: should public recreation be allowed on reservoirs and catchments and if not, why not? Current practice varies; some authorities appear to be excessively protective, other, considerably less protective. A firm, non-political, unemotional examination of the matter would be of interest. In any event it seems anomalous that in one city, Melbourne, no or almost no access to reservoirs or catchments is permitted, yet in another, Adelaide, the construction of private dwellings on catchments is tolerated.

And secondly there is the matter of reservoir stratification. Of importance here is the development of anoxic layers and the concomitant problems that can arise in draw-off water. P.A. Tyler (in press) discusses various features of this problem from a Tasmanian viewpoint. The effectiveness of artificial destratification as a technique for ameliorating the problem has been well vindicated by its employment in Prospect Reservoir (Bowen and Smalls, in print), but much remains for determination with regard to artificial manipulation of limnological events in reservoirs for purposes of better management. However, the potential usefulness of artificial manipulations is certainly being recognised in Australia as evidenced by the inclusion into new engineering structures of provisions for artificial aeriation (and thus destratification), e.g. at Dartmouth Dam (Powling, in press).

Waste management

At the other end of the pipeline, so to speak, a host of applied limnological problems lie in wait. They largely concern, of course, sewage treatment and the impact of environmental discharge of both treated and substantially untreated waste materials, but other events are also implicated.

Conventional waste treatment beyond the primary stage, whatever the physical appearance of the treatment plant, is still mainly a biological process. As such, the principal agents of purification are bacteria, protozoans and algae operating in highly artificial water bodies. Yet for almost all stages in the process of purification fundamental knowledge concerning the functional processes is lacking. For waste stabilization ponds, for example, as pointed out by B.D. Mitchell (in press), we are a very long way from any position which is other than the largely ad hoc one presently occupied.

It is convenient to note here, too, the considerable scope for applied limnological endeavours in the area of waste reuse. Strom (in press) and Williams (in press a) deal with this subject from, respectively, a pragmatic and theoretical viewpoint, but a more comprehensive exposition of both viewpoints has recently been given by Gutteridge, Haskins & Davey (1976). Considering merely those areas of this subject presently being investigated (mostly other than in Australia of course), it is noted that more information is needed on:

/1.

1. the actual composition of sewage and other wastes (surprisingly, detailed and comprehensive analyses are rare)
2. the culture of algae and fungi on waste media
3. the synthesis of bacterial biomass from wastes
4. the culture of macrophytes in waste stabilization ponds and their effectiveness as purification agents
5. the culture of invertebrates in waste
6. fish culture in waste stabilization ponds, and,

of less direct limnological relevance

7. the agricultural use of waste material, and
8. the use of wastes as a primary source of proteins, vitamins, etc.

It is as well to emphasise that little waste reuse in fact occurs in Australia; most wastes, treated or otherwise, are discharged to the environment. Indeed, even when reuse occurs, this is more an alternativel mode of treatment than a conscious effort at resource conservation. For many treatment plants the particular environment which received the plant effluent is the inland aquatic one. Thus, of 667 Australian sewage treatment plants serving populations between more than 2,000 and less than 50,000 people, over half discharge effluents to small streams, rivers, and lakes (Williams, in press b). This, whilst most unfortunate ecologically, provides yet further scope for applied limnologists in the form of needed pollution control measures. Biological monitoring and the development of water quality criteria are two particularly important subjects within this context.

With regard to the former, I note that despite the many advantages of biological monitoring vis-a-vis other types of monitoring, it is still little used in Australia as an assessment and predictive device (areas in which it has major strengths). Perhaps this is partly explained by the fact that in order for biological monitoring to be fully useful, more work is needed on taxonomy, autecology, toxicity and bioassays, and environmental description (Williams, in press c). Even so, biological monitoring could be put to better use in Australia than is presently the case, and there are indications already that at least four Australian freshwater animals have potential use as bioassay subjects (Austrochiltonia australis (or subtenuis), Paratya australiensis, Velesunio ambiguus, and Galaxias maculatus).

Hart (in press) deals with the range of problems associated with the development of water quality criteria. He notes that a great deal more information is needed on the sources, fates and effects of aquatic pollutants - and also that there are many difficulties caused by our lack of knowledge on the application of threshold effects, the extrapolation to lethal levels, the usefulness of single species testing, changes in the chemical form of pollutants, bioaccumulation, synergism and pollutant transformation. The legislative aspects of water quality criteria development are additional headaches, as too are the ways in which published criteria can be realistically updated.

Perhaps a passing reference to Environmental Impact Statements can be squeezed in at this point without too much offence to the logic of this address. Whereas the intention behind the formulation of legislation which required the production of Environmental Impact Statements for major projects was undoubtedly well-intentioned, the implementation of the legislation is frequently a cause for intellectual dissatisfaction. At the same time, however, I believe that

/there

there is a valuable role for limnologists in the preparation of Environmental Impact Statements; and, provided their preparation is tackled with a sizeable dollop of realism, a sensible contribution and responsible conclusions may result, Schindler's "boondoggle" notwithstanding!

A few other limnological problems under the general heading of waste management deserve at least fleeting mention. Here are some: the management of regional catchment basins (the A.C.T. Regional Basin is a case in point), the methods for control of eutrophication sensu lato, the use of man-made lakes as pollution control measures, the relationship between urban hydrology and water quality, and the monitoring of environmental damage caused by mining activities. There are, of course, many more.

Aquatic environments

Again, I can be brief on this subject - though brevity here is largely a reflection of the simplicity of the case. Baldly stated, in a dry continent we know comparatively little about several aquatic environments of considerable utility. Our lack of knowledge concerning the ecology of waste stabilization ponds has already been mentioned. Little too is known about the River Murray, despite its economic importance to towns from Albury to Adelaide (not to mention innumerable irrigators), and its importance as both a sewer, natural treatment mechanism, and source of water supplies. Farm dams, ubiquitous throughout settled areas of Australia, and obviously of considerable value to stock, likewise largely remain an unknown entity (Timms, in press). And finally, large man-made impoundments, though perhaps better studied than most aquatic environments in Australia, still provide profitable areas for much limnological exploration with management objectives in view.

Concluding remark

I trust I leave you with the impression that there is no shortage of limnological problems with regard to Australian water resources!

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T E A R O F F

Nominations are called for the Jolly Award.

They should be forwarded to the Secretary-Treasurer.

We hereby nominate . . . . . .

who accepts nomination, for the Jolly Award.

Proposer (in PRINT) . . . . . .

Signature . . . . . .

Seconder (in PRINT) . . . . . .

Signature . . . . . .

Nominations are called for the Jolly Award.

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Proposer (in PRINT) . . . . . .

Signature
. . . . . .

Seconder (in PRINT) . . . . . .

Signature
. . . . . .

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